

REMARKS/ARGUMENTS

Reconsideration of the present application, as amended, is respectfully requested.

A. Status of the Claims and Claim Amendments

As a result of the present amendment, claims 1-24 are presented for continued prosecution.

The claims have been amended in reply to the Examiner's objections and rejections in sections 5 and 7 of the Office Action. Applicant appreciates the numerous proposals offered by the Examiner. Applicant has adopted the proposals, and it is believed that the amendments are self-explanatory. However, it is noted that "the T.T.T. diagram (14.1)" recited in claims 8 and 12 has antecedent basis in claim 1. For claim 13, "means specific algorithm" has been replaced by "means of a temperature regulation algorithm", which is supported in the final paragraph on page 7 of the application.

New matter has not been added by these amendments.

B. Objections to the Drawings

Paragraph 2 on page 6 of the application has been amended to insert reference character 7.1. Support for this amendment can be found in claim 2.

The Examiner stated that the reference character L_1 is not mentioned in the specification. However, reference character L_1 appears in the equation in line 21 on page 8 on the application.

C. Specification Objections and Amendments

The Abstract has been amended to comply with conventional U.S. format. The specification has been amended to insert section headings. Also, the specification has been amended to correct the grammatical errors summarized by the Examiner in section 4 of the Office Action. However, "350 m" is correct has not been replaced with a shorter dimension.

D. The Invention

The present invention, as defined by the amended claims, includes a process and production line for continuous production of ultra thin hot rolled steel strips from thin slabs.

In one of the novel aspects of the invention, the mould has a geometry which provides a central crown on the slab. In addition, a roughing mill is employed to provide a crown on the intermediate strip.

In another novel aspect of the invention, the slab thickness is reduced during solidification which achieves a fine crystal structure, reduces inner cracks and segregation, thereby producing improved characteristics in the material (see paragraph 7 page 3 of the application).

In yet another novel aspect of the invention, a secondary cooling is provided during continuous casting to achieve a homogenous temperature (see paragraph 1 page 4 of the application).

E. Claim Rejections under 35 U.S.C. § 103(a)

Claim 1-24 have been rejected as being unpatentable over Kajiwara et al (US 5,634,257) in view of Reynolds et al. (GB 2 327 375) in view of Arvedi (WO 00/59650).

Initially, Applicant notes that Kajiwara, Reynolds and Arvedi were cited in the International Search Report (ISR) in the corresponding International application. A copy of the ISR and the International Preliminary Examination Report (IPER) were disclosed in an IDS submitted on July 15, 2004. In the IPER, the International Examiner explained that the claimed invention is patentable over the combination of Kajiwara, Reynolds and Arvedi for at least four reasons (see section 2 of the IPER). Although the Examiner is not required to follow the International Examiner's determination of patentability, it is respectfully requested that the Examiner that consider the IPER and the novelty summarized therein when reading the following comments.

In order to maintain an obviousness rejection under 35 U.S.C. § 103(a), the differences between the claimed invention and the prior art must be obvious to a person of ordinary skill in the art at the time the claimed invention was made. Applicant respectfully submits that the claimed invention is not obvious over a combination of the cited references for at least the following reasons.

1. Kajiwarra does not teach or suggest providing a crown on the slab.

Claim 1 recites that the slab leaves the mould with a central crown. Similarly, claim 13 recites that the continuous casting machine provides a crown shape to the slabs. The crown shape can be achieved using a mould having a specified geometry (see lines 15-19 on page 3 of the application).

The Examiner cited the roll bending apparatus in column 7, lines 17-28 of Kajiwarra to teach that a crowned shape to the slab. Applicant respectfully disagrees with the Examiner's reading of Kajiwarra.

The roll bending apparatus of Kajiwarra is an apparatus of the finishing mill (see column 7, line 17 Kajiwarra). The crown shape provided in the finishing mill of Kajiwarra is therefore imparted to the rolled strip, not the slab as recited in claims 1 and 13. It is well known that a slab is a material that is fed into the mould, while the rolled strip is obtained at the end of the process. Thus, Kajiwarra does not teach or suggest providing a crown shape on the slab as recited in claims 1 and 13.

In addition, claims 1 and 13 recite that the roughing step provides a crowned shape. The crowned shape provided by the roughing step is also not disclosed by Kajiwarra, because the roughing step is performed upstream of the finishing mill. This aspect of claims 1 and 13 is therefore also not taught by Kajiwarra.

Since Kajiwarra does not teach or suggest providing a crown shape to the slab or providing a crown shape in the roughing step, Applicant respectfully submits that the subject matter of claims 1 and 13 is not obvious based on the teachings of Kajiwarra.

2. Kajiwarra does not teach or suggest reducing the slab thickness during solidification.

Claim 1 recites that the slab is reduced in continuous casting during solidification. Similarly, claim 13 recites that a roller table reduces the slab thickness during solidification. Applicant discovered that reducing the slab thickness achieves a fine crystal structure and reduces inner cracks and segregation which result in improved characteristics of the material (see paragraph 7 on page 3 of the application).

It appears that the Examiner did not specifically cite a portion of Kajiwarra to teach reducing the slab thickness during solidification. Based on Applicant's reading, this aspect of the claimed invention is not taught or suggested by Kajiwarra.

As shown in Figure 1a of the present application, roller table 3 reduces the slab thickness in a location downstream of the mould. The apparatus of Kajiwara does not include a device downstream of the mould which reduces the slab thickness. Applicant therefore respectfully submits that claims 1 and 13 are not obvious based on the teachings of Kajiwara, because Kajiwara does not teach or suggest reducing the slab thickness during solidification.

It is noted that the Examiner stated that Figures 1 and 3 of Kajiwara include a "reducing roller" operating at casting speeds of at 10 m/min (see lines 1-4 on page 12 of the Office Action). Applicant respectfully disagrees with the Examiner's reading of Kajiwara. In column 10, lines 15-20, Kajiwara explains that the rolling speed is 10 m/min during rough rolling. However, there is absolutely no teaching that "reducing rollers" are provided, or that the thickness of the slab is reduced. Applicant therefore respectfully requests reconsideration of the Examiner's interpretation of Figures 1 and 3 and reading of col. 10, lines 15-20 of Kajiwara, because it is believed that Kajiwara does not teach or suggest reducing the slab thickness as recited in claims 1 and 13.

3. Reynolds does not teach or suggest a secondary cooling during continuous casting.

Claims 1 and 13 recite that secondary cooling is performed during continuous casting. More specifically, claim 1 recites that secondary cooling is provided during the liquid steel core reduction step, with specific characteristics for water delivery, cooling density, and cooling fluid flow rate. As shown in Figure 1a of the present application, secondary cooling (3B) is performed in continuous casting 1.

The Examiner cited cooling stages 18 and 43 of Reynolds to teach the claimed secondary cooling of the present invention. Applicant respectfully disagrees with the Examiner.

As mentioned above, the secondary cooling of the present invention occurs during continuous casting as recited in claims 1 and 13. In contrast, cooling 18 of Reynolds is performed on a strip that has been previously been rolled (see lines 36-37 on page 6 of Reynolds), and cooling 43 of Reynolds is provided immediately upstream of the finishing mill (see lines 14-20 of page 7). Thus, cooling stages 18 and 43 of Reynolds are not employed during continuous casting as recited in claims 1 and 13. Applicant therefore respectfully submits that claims 1 and 13 are not obvious, because Reynolds does not teach or suggest providing a secondary cooling system during continuous casting.

F. Fees

An extension of time is requested and payment is enclosed herewith. No further fee is believed to be due. If, on the other hand, it is determined that fees are due or any overpayment has been made, the Assistant Commissioner is hereby authorized to debit or credit such sum to Deposit Account No. 02-2275. Pursuant to 37 C.F.R. 1.136(a)(3), please treat this and any concurrent or future reply in this application that requires a petition for an extension of time for its timely submission as incorporating a petition for extension of time for the appropriate length of time. The fee associated therewith is to be charged to Deposit Account No. 02-2275.

G. Conclusion

In view of the actions taken and arguments presented, it is respectfully submitted that each and every one of the matters raised by the Examiner has been addressed by the present amendment and that the present application is now in condition for allowance.

An early and favorable action on the merits is earnestly solicited.

Respectfully submitted,

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